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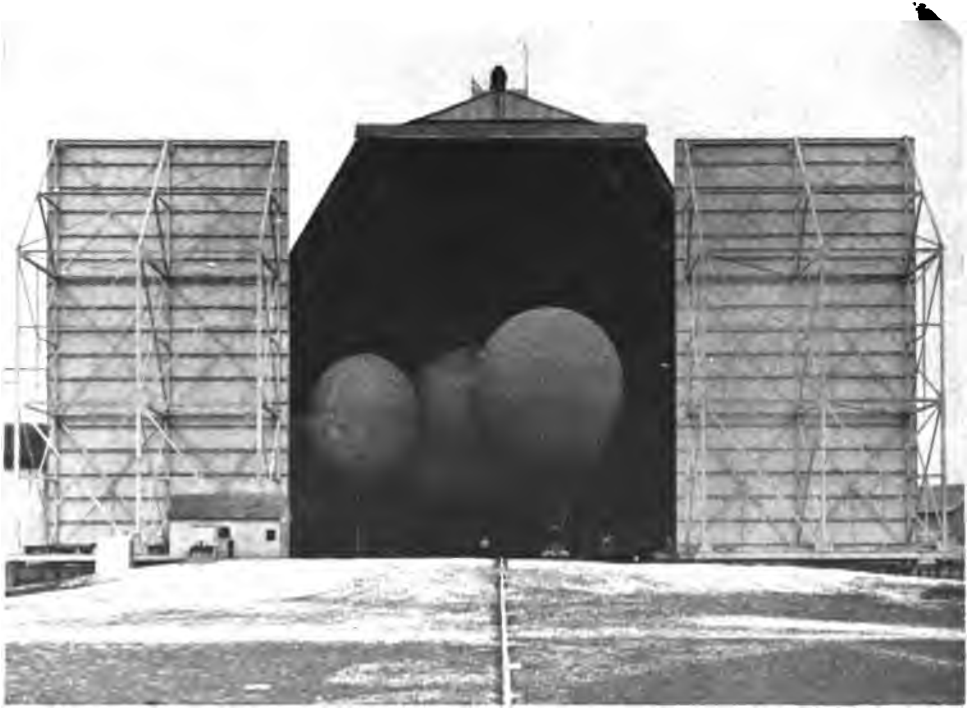

Free Balloons in mouth of hangar built by Goodyear and taken over by the Navy Department after the United States entered the War

FREE BALLOONING

Compiled by

The Goodyear Aeronautics Department

Lighter-than-Air Division
Balloons of any size and every type

Heavier-than-Air Division
Everything in rubber for the airplane

THE GOODYEAR TIRE & RUBBER COMPANY
Main Offices and Factories, Akron, Ohio   Western Factory, Los Angeles, California
Canadian Factory, Toronto, Ontario, Canada

TL615

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By THE GOODYEAR TIRE AND RUBBER COMPANY

To the Aero Clubs and Aeronauts of America

upon whom to a large degree rests the responsibility of familiarizing the public with the advantages and benefits to be gained from aerial transportation, so that the public will adopt it on a national and international scale,

This booklet is dedicated.

Foreword

FOR nine years The Goodyear Tire and Rubber Company has been the dominating center of balloon development in America. For nine years it has been the largest manufacturer of balloons and rubberized balloon fabrics; for nine years the largest manufacturer of airplane tires and airplane rubber accessories.

There is a fundamental reason for this marked leadership. The men who have guided the destinies of Goodyear fortunately are men of vision. In the days when people laughed at the idea that passenger travel by air was ever to be a commercial commonplace, these men saw the future. They had faith in the possibilities of aeronautic development and backed up that faith with the great resources of The Goodyear Tire & Rubber Company.

Without those resources, the Aeronautics Department would never have been able to keep going along the stony and unblazed path of the pioneer; for the experimenting and development costs were way out of proportion to the volume of business available at the time. But those who had the faith knew that these pioneering costs were not out of proportion to the volume of business to be available in the future.

Now the dark days are past. The dawn of a brighter day is here. The future of commercial aerial transportation is definitely in sight. In that future it is the aim and purpose of The Goodyear Tire & Rubber Company to foster aviation—not only by developing and constructing the best product possible in both the lighter-than-air and heavier-than-air fields, but also in rendering to owners of aircraft, and therefore to the public, such services as to help make aviation practicable, economical and safe.

To the Aero Clubs and Aeronauts of America—

A Challenge

In connection with aeronautics, every time we think of the War being over we are prone to revel in memories. For our thoughts go back to those days when ballooning knew no war except the fighting spirit, the keen rivalry, of true sportsmanship. We recall the fun and excitement of the flights each week-end our own Aero Club made. We remember the aeronautic lectures and banquets the Club had, and the lively interest that was stimulated in aerial activities in general. Then, when we consider the wonderful strides aviation has made since, when we realize that the number of pilots has increased many hundred fold, that the layman is eager to "take to the air," we thrill at the opportunity this day affords for a real revival—let us call it "come-back"—of the sport of ballooning.

"Come-back" implies challenge. We like to see a trained athlete come-back after he has been beaten. We like to see a team come-back after consistent loosing. We like to see an old sport made popular again. Now that the War is over, and Government restrictions on civilian flying have been lifted, we should like to see Free Ballooning stage a strong "come-back."

The Aero Club of St. Louis has issued the challenge. The National Balloon Race of October first is the first of its kind since 1916. There has not been an International Race since 1913. And there were many local contests back in those days that we have not heard of so far since the War. So we congratulate St. Louis and we thank St. Louis for bringing those good days back to us again.

Those who have aeronautic knowledge and experience of value to others have a certain responsibility they must not ignore. In fact, it is their duty to further the cause of aviation in as intelligent a manner as possible. For the sooner the manifold benefits of safe and economical aerial transportation are brought into our daily mode of living, the better off, the further advanced, will be our present day civilization. And the sooner the public is educated up to the possibilities of aeronautics, the sooner will these benefits be gained. As Glenn Curtiss so aptly put it, "The problem of aeronautics is no longer flight. It is education!"

Goodyear's aeronautic knowledge, her pioneering efforts, her flying experience, bring upon her the responsibility just mentioned. It is our aim to live up to this responsibility. If we dealt only with sales efforts to bring in the maximum amount of orders, we would be falling far short of our obligation. The responsibility mentioned involves more than the promotion of our own business. It calls for the promotion of aeronautics in general.

Now—is there an Aero Club in your city? Is your Club active? Have you singled out those ex-Service pilots and are you making them an asset to your Club? Things are happening too fast in aeronautics for us all to keep in accurate touch. Commercial aviation is forging ahead. But, unfortunately, America is several paces behind her friends across the water in the present vast progress of the science of flying. There is much to be done.

Can we help stimulate interest in aeronautics in your city? May we help your Aero Club? Our experience, our data files, our pilots, our aeronautic engineers and our balloon factory are at your disposal. We are planning to serve as an Aeronautic Exchange and from time to time issue a bulletin that will be of interest to you. Send us accounts of your activities. If you have a challenge to make, we will find you a worthy rival. If you have questions to ask, we will endeavor to correctly answer them. If you have problems confronting you, we will help you solve them.

Because this message to you happens to appear in this booklet on "Free Ballooning" we are making a special plea for the revival of this sport. But free ballooning is only one of the many ways of educating the public, of initiating the layman. The kite balloon, the dirigible and the airplane all have their fields. We want to promote aviation in all its phases. If all of us interested in aviation pull together, the day of universal aerial transportation will come the sooner. Let us cooperate.

Aero Clubs

Aerial League of America
280 Madison Avenue
New York, N. Y.

Aero Club of New England
940 Old South Bldg.
Boston, Mass.

Aero Club of Ohio
Canton, Ohio

Aero Club of St. Louis
15th and Pine Sts.
St. Louis, Mo.

Aero Club of Buffalo
Lafayette Hotel
Buffalo, N. Y.

Aero Club of Pittsfield
Pittsfield, Mass.

Aero Club of Dayton
Dayton, Ohio

Kansas City Aero Club
506 New England Bldg.
Kansas City, Missouri

Harvard Aeronautical Society
Harvard University
Cambridge, Mass.

Aero Club of Illinois
430 South Michigan Ave.
Chicago, Illinois

Aircraft Club of Peoria
Peoria, Ill.

Aero Club of Michigan
Detroit, Mich.

Milwaukee Aero Club
Milwaukee, Wis.

Western Aero Association
Topeka, Kans.

Pacific Aero Club
Menadneck Bldg.
San Francisco, Calif.

Rochester Aero Club
Rochester, N. Y.

Aero Club of Connecticut
Bridgeport, Conn.

Aero Club of Pennsylvania
Morris Bldg.
Philadelphia, Penna.

Queen City Aero Club
4014 30th Ave.
Cincinnati, Ohio

Wichita Aero Club
Wichita, Kans.

Aero Club De Cuba
Ignacio 5
Havana, Cuba

Aero Club of the Northwest
1000 Hodge Bldg.
Seattle, Wash.

Aero Club of Iowa
Grinnell, Iowa

Aero Club of Hawaii
Capitol Bldg.
Honolulu, T. H. H. I.

Aero Club of the Philippines
Manila, P. I.

Aero Club of Lincoln
Lincoln, Nebr.

Aero Club of Texas
Houston, Texas

Aerial Club of Indiana
Terre Haute, Ind.

Washington Aviators Club
Washington, D. C.

Atlantic City Aero Club
Atlantic City, N. J.

Colorado Aero Club
Denver, Colo.

A Word as to Balloon Races

By Ralph H. Upson

Chief Aeronautic Engineer of The Goodyear Tire & Rubber Company
Present Holder of the Gordon Bennett International Balloon Trophy

There are many different kinds of balloon contests, but all the big races, including the American National and the Gordon Bennett International, are for distance only; that is, the winner is he who lands farthest (in a straight direction) from the starting point regardless of the direction or route taken and regardless of the altitude or the endurance of the flight.

Indirectly however, all these other factors are intimately connected with the final result, for a pilot cannot make the maximum distance without choosing the proper direction and route to be followed. He cannot attain these without being able to keep at the proper altitude and have the largest possible choice of altitude. Finally if all other things are equal the pilot who can stay up the longest is likely to go the farthest.

The winner of the race is the pilot who uses the best judgment in choosing between the different possibilities available and who has a balloon best able to fill his requirements.

The rules for the big races are governed by the International Federation of Aero Clubs in which the Aero Club of America is the American representative.

The Gordon Bennett Balloon Trophy*

In 1906 James Gordon Bennett presented a handsome silver cup to be competed for by the clubs of various countries composing the Federation Aeronautique Internationale. To become the permanent property of a club, the cup had to be won three times in succession. The winning pilot of each race is presented with a gold replica, and the club which he represented with a large silver plaque of the cup. For the first four years Mr. Bennett also offered a cash prize of $2,500 to the winner.

The first annual contest for the cup started from the Tuileries Gardens in Paris, September 30, 1906, under the auspices of the Aero Club of France. Clubs of the following countries had entered sixteen balloons: United States, Great Britain, France, Belgium, Italy, Germany, and Spain.

The balloons used more than a million cubic feet of gas, and attracted fully 250,000 spectators. The first balloon to start was the entry of the Italian Club. It left the ground promptly at 4. p. m., and at five-minute intervals the rest followed. The Aero Club of America's entry, the balloon "United States," piloted by Lieutenant Frank P. Lahm, was the twelfth to start, and got away at 4:45 p. m. At 11 p. m. there was a decided change in direction, and it was evident they would have to cross the sea, and at 11:17 p. m. they drifted out

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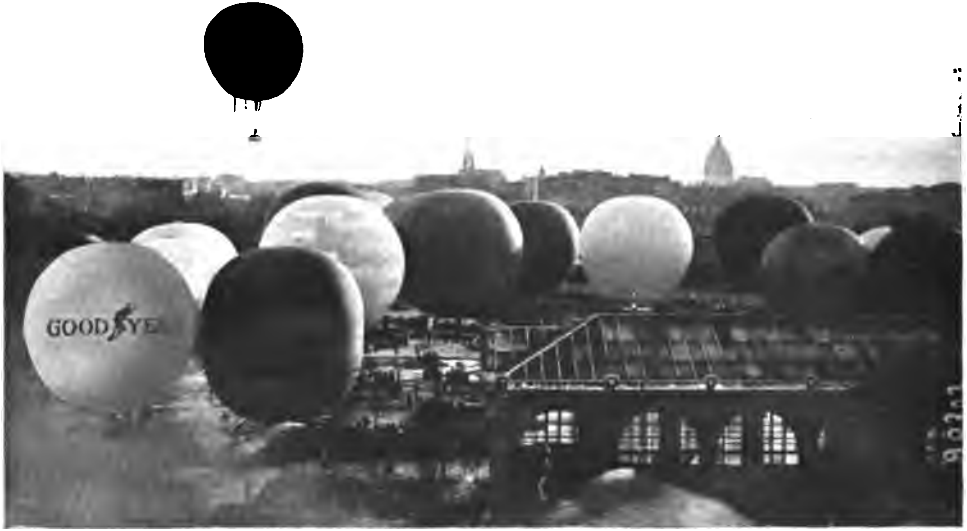
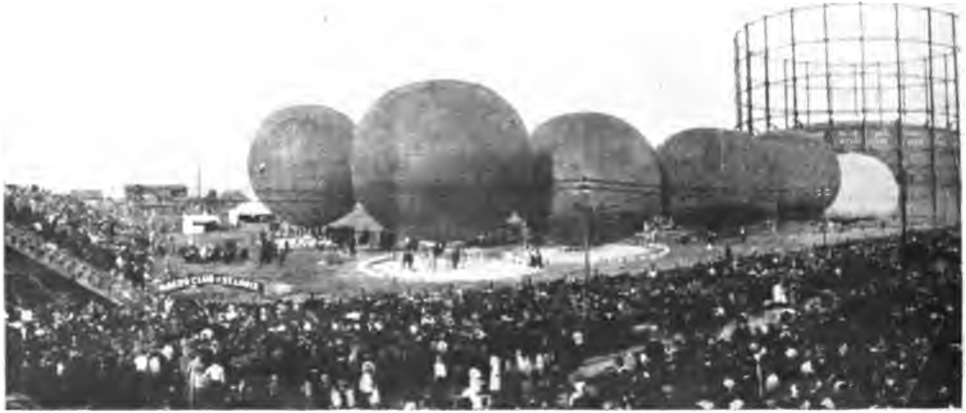
*(Editor's Note: For the information contained in this article we wish to acknowledge our indebtedness to the "AERO BLUE BOOK," edited by Henry Woodhouse.)



Paris 1913. Start of the last International Race. Won by R. H. Upson, U. S. A. representative.

over the English Channel with the guide rope just off the water. At 3:30 a. m. the next morning they were over England. At 2 p. m. they reached an altitude of ten thousand feet, and shortly afterward the North Sea coast was sighted straight ahead, and it was necessary to valve and get to a much lower level, and finally to land, which they did at 3:12 the afternoon following the start of the race. The landing place was Flying Dales, 410 miles from Paris. Shortly after landing they received the good news that they had won the race.

The winning of the first International Race by the United States put the responsibility of the next year's race up to the Aero Club of America. On Monday, October 21, 1907, the second race for the cup was started from St. Louis. There were nine entries: Three from Germany, two from France, one from England, and three from America. At this time it must be remembered that aeroplanes were practically unknown, and balloon flights attracted considerable attention. It is estimated that 300,000 people saw the start of this second race. Everything went off according to schedule. The first balloon, the Pommern of Germany, Oscar Erbsloh, pilot, started promptly at four o'clock, and the rest in regular order five minutes apart. As each balloon started, the band played the national air of the country it represented. The race was won by Erbsloh, who landed at Asbury Park, making a distance of 872 miles, which broke the American record that had stood since 1859, when Professor Wise



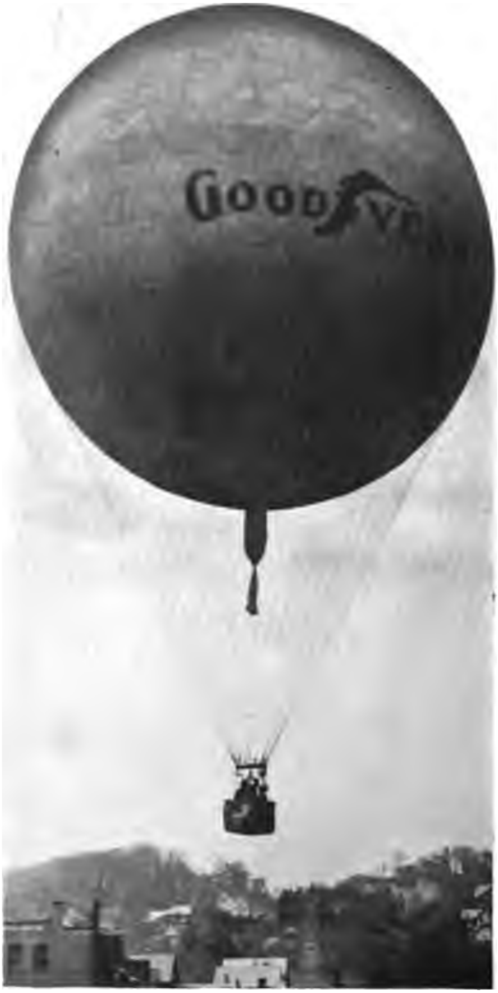
Courtesy of The Aero Blue Book.

St. Louis, 1910. Fifth International, won by A. R. Hawley, representing the U. S. A. Established a new American distance record, 1,172 miles. Landed far into Canada and was lost for seven days in the wilds of the forest. When found, he and his aide, Post, were nearly exhausted from hunger and fatigue.

made his flight from St. Louis to Henderson, N. Y. The race was christened "The Blue Ribbon Event of the Sky," and was spoken of as the most notable sporting event ever held in America.

For the third race, held in Berlin, October 11, 1908, there were twenty-three entries from the aero clubs of the following countries: America, Germany, Spain, England, Belgium, Switzerland, Italy, and France, this being the largest number of balloons to start since the race was organized. This race was won by Colonel Schaeck, representing the Swiss Aero Club, who established a world's record for duration, staying in the air 73 hours. His distance was 753 miles.

The fourth race was held in Zurich in October, 1909, under the auspices of the Swiss Aero Club, and was won by the Aero Club of America's representative, Mr. Edgar W. Mix, who landed in Warsaw, 696 miles from the start. This brought to the United States the fifth race, which was held in St. Louis, October 17, 1910. There were ten entries: America, Germany, Switzerland, and France being represented. The race created great excitement, as a number of the contestants were not heard from for days. The "America II," with Hawley and Post, was given up for lost. If they had not fallen in the Great Lakes but had gone on up into the trackless areas of Canada, Professor Brock of the Dominion Survey said he had little hope of their ever being found. Large rewards were offered for anyone finding them. It finally turned out that the "America II"

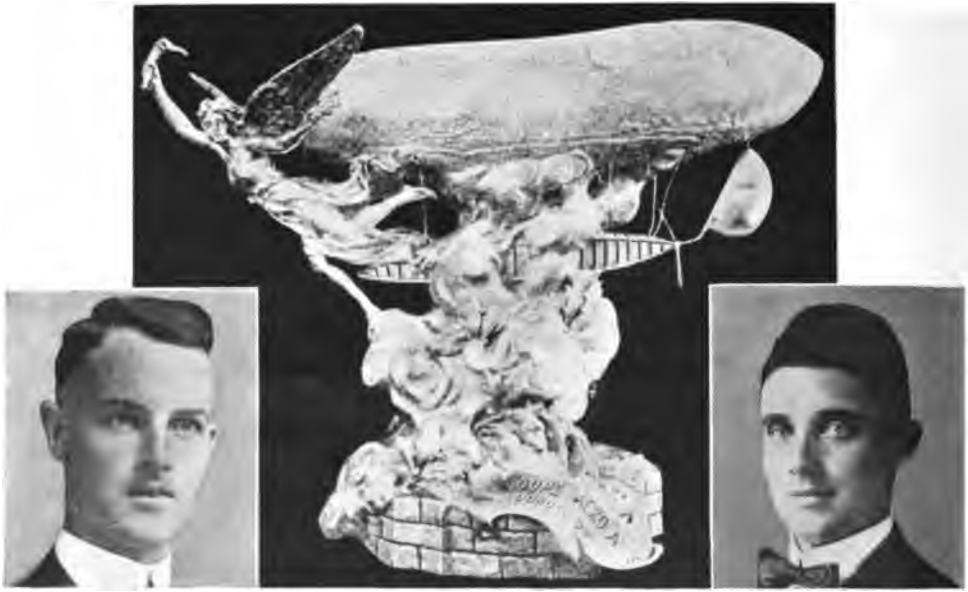


This balloon, which was the first 80,000 cu. ft. spherical Goodyear built, has a remarkable record to its credit. It won the 1913 International Race, the 1913 and 1914 National Races, and was used for four seasons, mostly by The Goodyear Aero Club, to our knowledge making more flights than any other balloon in the United States landed just north of Lake Tchotogama near the Peribonka River, about fifty miles away from St. Ambroise, the nearest habitation. Hawley and Post left St. Louis Monday, and landed Wednesday afternoon, and were lost in the wilderness until the following Wednesday. After tramping five days and getting almost to the point of exhaustion because of lack of food, they met two trappers, who guided them to St. Ambroise, where they received the good news that they had won the race. They were in the air 46 hours, and traveled 1,172 miles in a direct line, thereby establishing a new American record.

The sixth race was held in Kansas City, October 5, 1911, France, Germany, and America competing. This race was won by Lieutenant Hans Gericke, who landed at Ladysmith, Wisconsin, having traveled 468 miles.

The seventh contest was held in Germany, starting from Stuttgart on October 27, 1912. Twenty balloons were engaged in the contest, which was won by Mr. Maurice Bienaime, of France, who landed near Moscow after traversing a distance of 1,358 miles, establishing a new world's record.

The race for 1913 took place on October 12, at the Tuileries Gardens, in the heart of Paris. Ballooning in France was popular and the Gordon Bennett Race attracted more than half a million persons, including all the authorities—sporting, political and military. The places of landing and distance covered by the first and second balloons were as follows:



The Gordon Bennett International Aeronautic Trophy won in 1913 by R. H. Upson (right) pilot of the "Goodyear", and R. A. D. Preston, aide (left). The Trophy will become the permanent possession of the first Club to win it three consecutive times.

1st. The "Goodyear," Ralph H. Upson, pilot, R. A. D. Preston, aide, crossed the Channel and landed near Bridlington on the Yorkshire coast, about 400 miles from Paris, having been in the air 43 hours and 20 minutes.

2nd. The "Uncle Sam," H. E. Honeywell, pilot, J. H. Wade, aide, landed at Pont de Buis, on the Atlantic coast, in Finistere, approximately 325 miles from Paris, having remained in the air 42 hours and 50 minutes.

The trophy was won by the combination of skill and daring. Veteran balloonists in Europe expressed their admiration of the way in which Messrs. Upson and Preston took advantage of certain atmospheric conditions the value of which the other balloonists failed to recognize. The following is quoted from a letter to the Aero Club of America from Mr. F. A. Seiberling, President of The Goodyear Tire & Rubber Company, the maker and owner of the victorious balloon:—

"This achievement was only accomplished through the scientific handling of the balloon by these young aeronauts. They were competing with men of experience, and under foreign conditions that from the beginning were considered a big handicap. These conditions, however, did not prevent the boys from exerting themselves to the utmost, and putting into practice all the knowledge they had ever known about the flying game.

"Mr. Upson has made a study of ballooning and was well informed on the various currents of air that were to be encountered along the coast. Upson and Preston have the honor of being the only two contestants who sailed their balloon outside of France. When the balloon 'Goodyear' headed for the ocean, Upson was familiar enough with the prevailing air currents to know that counter winds would be met that were sure to blow him up into England. This proved to be the case. They traveled miles out over the Atlantic, however, before these winds were encountered. Their scientific study of ballooning and the gas tightness of the fabric were the main reasons for enabling them to win."

This victory brought to the United States for the fourth time the honor of holding the next year's race in this country. However, the War prevented the race from being held. The National Race out of St. Louis on October 1, 1919, was again won by Ralph H. Upson, piloting the "Goodyear II," thereby fairly assuring his representing the United States in the International Race. The representatives, however, have not yet been selected. The ninth International Gordon Bennett Balloon Race will be held in this country in the fall of 1920.

American Free Balloon Records

Distance: 1172 miles, made by Alan R. Hawley, flying from St. Louis to Lake Tchotogama, Canada, October 17-19, 1910.

Duration: 48 hours, 26 minutes, made by C. B. Harmon, ascending from St. Louis, October 4 and landing at Edina, Missouri, October 6, 1909.

The Invention and Early History of the Free Balloon

We are living in a wonderful age. We are living to see and to take part in man's conquest of the air. In the marvel of the rapid developments of the past few years we are apt to think of it all as an entirely new thing, a strictly twentieth century creation. Little do we realize that possibly as far back as 1306 the Chinese understood the laws of the balloon, when it is reported an ascension was made at Pekin on the day of the coronation of the Emperor Fo-Kien. In fact, most of us do not know that in Europe free ballooning has been an established science and sport for over a century.

From the legends and myths that have come down to us, we know that man has had aspirations to soar through the heavens for many ages, but as persistant as this in-born desire has been, it seems that man was unable to dream along practicable lines until the discovery of hydrogen. In 1776 Cavendish discovered this gas and found that it was much lighter than air. A year or so later, Dr. Black claimed the honor of being the first to state that bodies could be lifted by filling hollow receptacles with this light gas. Leo Cavallo demonstrated the truth of this statement by blowing soap bubbles with hydrogen, and began experimenting on rubber solutions, varnishes and oils for doping paper bags to make them gas tight. But despite the theorizing and experimenting that was stimulated by the discovery of hydrogen, the honor of inventing and flying the first real balloon fell to the Montgolfier brothers in 1782. Furthermore, their first success was with a hot air balloon (they had been unsuccessful in their experiments with hydrogen). Thus the first balloon invented was one that could have been invented at any time since the birth of weaving. For thirty centuries people could have built hot air balloons—they had the materials; all they needed was the idea. Joseph Montgolfier conceived the "idea" while sitting in front of his fireplace dreaming of the possibilities of flight. He noticed that the smoke went up the chimney. "Why not harness that smoke!" Such was the simple and commonplace incident which led to the invention of the balloon.

After several private tests with small balloons of about 700 cu. ft. capacity, the Montgolfiers built a big 35 ft. diameter paper bag for their first public demonstration. The balloon, with its frame, weighed 300 lbs. and had a volume of nearly 23,000 cu. ft. When the crowd, assembled for the occasion, saw this huge, heavy bag, none could believe it would float. However, after the Montgolfiers had lit a fire under the opening the highly decorated bag gradually filled out, taking shape in most graceful fashion, and upon being released, to the astonishment of all, rapidly rose until nearly out of sight. In ten minutes it attained an altitude of approximately 6,000 feet, drifted for over a mile and then sank gently to the ground, due to the cooling of the hot air. Thus, on June 5, 1783, at Annonay, France, the home of the Montgolfier family, occurred the public inauguration of aeronautics.

The Academie des Sciences immediately invited the Montgolfier brothers to repeat this wonderful experiment in Paris. Furthermore, they started a public subscription to defray the expenses of constructing and inflating a balloon and turned over to their physicist, Professor Charles, the problems of its design and construction. Fortunately, Charles was a fertile inventor and had original ideas of his own. Instead of more or less duplicating the hot-air balloon of the Montgolfiers, he gave to the world its first hydrogen balloon. This first forerunner of our modern gas balloon was not so primitive as might be supposed. Not only was it made of cloth, instead of paper, but the cloth was rendered gas tight by a rubber solution, as are the balloons of today. It was 13 feet in diameter, having a capacity of only 1150 cu. ft., about one-twentieth that of the Montgolfier balloon, and yet due to weighing only 25 lbs. and being inflated with hydrogen, had a lift greater than that of the big hot-air balloon. Being ball shaped, it became termed a "balloon."

So crude was the apparatus for generating the hydrogen, that the process of inflating this small gas bag required four days. Over quarter of a ton of sulphuric acid and over half a ton of iron filings were consumed, a sufficient quantity nowadays to inflate five balloons the size of their one. Furthermore, now we inflate balloons in four hours instead of four days. The following, quoted from Cavallo's "Elements of Natural or Experimental Philosophy," published in this country in 1829, is interesting in that it describes the first balloon gas plant: "The apparatus for filling it consisted of several wooden casks placed round a large tub full of water, every one of which had a long tin tube, which terminated under a vessel or funnel, that was inverted into the water of the tub. A tube then proceeded from this funnel, and communicated with the balloon, which stood just over it. Iron filings and diluted sulphuric acid were put into the casks; and the gas which was extricated from those materials, passed through the tin tubes, then through the water of the tub, and, lastly, through the tube of the funnel into the balloon."

When, on August 27, 1783, the balloon was at last fully inflated, Paris declared a holiday and all turned out in festive attire to witness the marvelous event. Throngs choked the streets, house-tops were crowded, windows were filled. At five o'clock, upon the boom of a cannon heard all over Paris, the balloon was released. The excited eyes of over 300,000 spectators saw the little bag rapidly rise and in two minutes pass from sight into the clouds. After drifting for three-quarters of an hour, it came down near a little village some fifteen miles distant. The peasants, seeing it mysteriously drop from nowhere, feared it to be a contrivance of the devil. So they pounced upon it with rakes and pitchforks, and finally completed its destruction by fastening it to the tail of a frightened horse. The Government had to issue a public notice to acquaint the rustic mind with the innocent nature of this new invention.

The next great public ascension was held on September 19, 1783, in the presence of the king and queen, the court, and a "vast assemblage of people of every rank." The balloon was a "Montgolfiere" 46 feet in diameter, having a capacity of approximately 51,000 cu. ft. The bag was made of waterproofed linen ornately decorated in oil colors, and beneath it was suspended a wicker cage containing the first aerial freight—a sheep, a rooster and a duck. These three had a short but exciting ride, rising to an altitude of some 1400 feet and being dumped out eight minutes later in a rough landing two miles away.

This experiment successful, the Montgolfier brothers decided to build a 100,000 cu. ft. balloon capable of carrying human passengers. The design of this first passenger balloon is particularly interesting. The car, which was attached directly to the bag (there being no net), was a circular wicker gallery running around the neck or mouth of the balloon. In this neck, which was 16 feet in diameter, was suspended a grate, and portholes or stoke-holes were located in the neck so that fuel could be thrown upon the grate from the gallery outside. Thus, as long as the passengers kept feeding the fire with fuel, they could remain aloft.

Courtesy of D. Appleton & Co., N. Y. C.

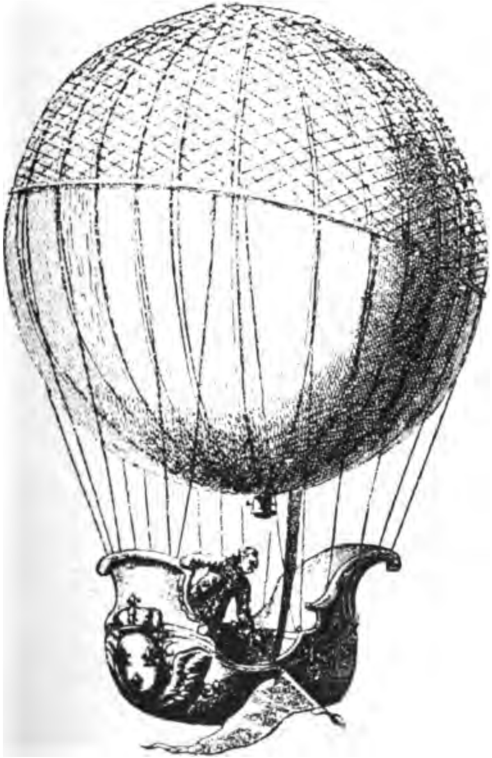
1783—The first flight by man.

When the vessel was completed, the question arose, "Who would be daring enough to trust his life to such a craft?" King Louis had two prisoners held under death sentence and thought this would be a novel way of killing them off. But two brave Frenchmen, Pilatre de Rosier and Marquis d' Arlandes, stepped forward, protested that the honor and glory of being the first human beings to fly should not go to two vile criminals but to worthy subjects of France, and after much persuasion, finally prevailed upon the King to put his prisoners to death in the usual manner.

On November 21, 1783, the first flight by man took place. The gallery was stocked with enough straw for an hour's journey, but evidently these pioneer aeronauts considered twenty minutes to be quite sufficient, for at the end of that time they ceased to feed the fire and landed gently some five miles from their starting point.

Not to be out-stripped by the Montgolfiers, Professor Charles now brought out the first hydrogen balloon for passenger carrying. It was far superior to the "Montgolfiere" type, as the hot air balloon had become known—in fact, considering that it was designed only five months after the first public appearance of this new invention, great credit must be given to Charles for introducing at that early stage fundamentals of design and operation so nearly correct that they have come down to us through over a century with but little change.

The following are the chief characteristics of our modern gas balloon which were first given to the world by Professor Charles. His balloon was built of rubberized fabric. The bag was a true sphere, instead of some artistic shape such as seemed to suit the fancies of the Montgolfiers. A net was employed for the suspension of the car. The bag was equipped with both an appendix and a valve. The car was equipped with sand ballast, an anchor, a barometer, a thermometer and other paraphernalia more or less similar to that seen in the basket of a modern free balloon. About all he lacked to completely anticipate the modern balloon was a drag rope, first used in 1820 by Charles Green, and a rip panel, invented in 1844 by America's pioneer aeronaut, John Wise.



Courtesy of D. Appleton & Co., N. Y. C., publishers of "Aerial Navigation" by A. F. Zahm.

The first hydrogen balloon for passenger carrying, invented by Charles. It was the first balloon to have a net, appendix, valve, sand ballast, barometer, thermometer and other paraphernalia known to the modern gas balloon.

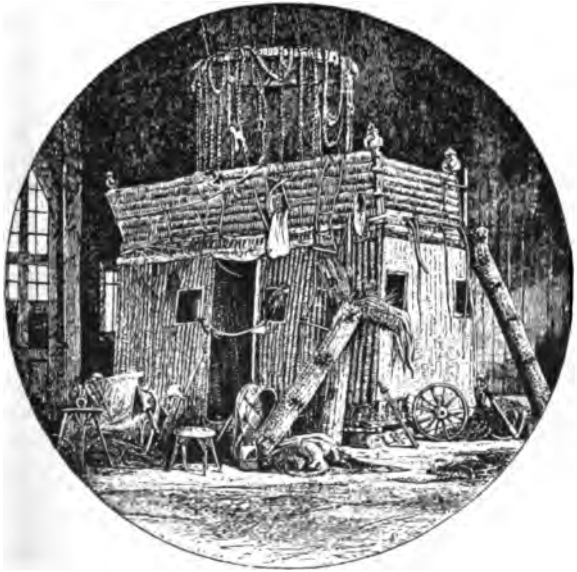
On December 1st, 1783, Professor Charles and M. Roberts, the manufacturer of the balloon, made the first passenger flight with hydrogen. Their little 14,000 cu. ft. balloon not only had a greater useful lift than the big 100,000 cu. ft. "Montgolfiere," but was under so much more perfect control because of their ballast and valve, that they stayed up two hours instead of twenty minutes, traveling a distance of thirty miles.

This made the "Charliere" or hydrogen type of balloon gain in popular favor, so a grand attempt was made to win back the prestige of the "Montgolfiere" type. A 104 ft. diameter bag was constructed, the largest spherical balloon ever built, having a capacity of approximately 590,000 cu. ft. But it took them over a week to get the thing inflated (the wind and rain hindered them so) and when they finally were ready to start, the balloon would lift only six people safely. Thus this gigantic bag would not lift any more than our standard 35,000 cu. ft. hydrogen balloon.

Perhaps the most memorable and most thrilling of all the early flights was the one that occurred on January 7, 1785. M. Blanchard, a pioneer French aeronaut, and Dr. Jeffries, an American physician, set out to cross the English Channel. They had nothing more than a "solo" balloon, a small 10,000 cubic footer, and were able to get away with only 30 lbs. of ballast. No one would think of taking such a risk these days—it would be called suicide. But they apparently were ignorant of their peril. About one-third of the way across they had to throw over half their ballast—about half way across, all their ballast. Then they began throwing over their books and personal belongings. But still they sank. So over went the oars and sails, needless paraphernalia which Blanchard had insisted would aid them in guiding the balloon through the air. About three-quarters of the way across they came so close to the water that they began stripping and throwing their clothes overboard. They were just on the point of crawling up into the load ring and cutting loose the basket, when they seemed to get into an upward current of air. As they approached the French coast, the air grew warmer and they rose out of danger, landing safely. A monument with suitable inscription was erected on the place of the landing to convey to future ages the facts relating to this first crossing of the Channel by balloon—a voyage which so nearly ended fatally.

In 1913, when Ralph Upson and R. A. D. Preston, the two Goodyear pilots, won for America the International Race out of Paris by landing in England, being the only contestants who dared attempt to cross the Channel, a great many people were under the impression that it was the first time the Channel had ever been crossed by a free balloon. Little did they realize that it was crossed as long ago as 1785. Nor did they realize the certainty with which it was crossed in 1913 as contrasted against the uncertainty in 1785. The papers were lauding these two brave American lads for their daring—for taking a sporting chance. But *they* were confident it was a sure chance—their daring was based upon knowledge. Contrast their 80,000 cu. ft. racing balloon with the little 10,000 cu. ft. solo balloon in which the first American crossed; contrast their 1000 lbs. of ballast with Dr. Jeffries' 30 lbs.; contrast their knowledge of meteorology with the knowledge existing in those early days. By such a comparison, one can begin to see the big strides that have been made in the science of ballooning since those century old days when Professor Charles made his first passenger balloon. He showed his contemporaries how to design and build a remarkably good balloon (considering the infancy of the invention) but he could not teach them the art of flying. We have learned a great deal about the fine points of aerial navigation in the past century, but there is always more to be learned. That is why ballooning is so fascinating—why it is called an "art."

(Editor's Note: For a more complete history of the Free Balloon, we refer you to Albert F. Zahm's "Aerial Navigation," published by D. Appleton & Co., N. Y. C., and to A. Hildebrandt's "Airships—Past and Present," published by D. Van Nostrand & Co., N. Y. C. We are indebted to these two books for much of the information contained in this article.



Courtesy of D. Appleton & Co., N. Y. C., publishers of "Aerial Navigation" by A. F. Zahm.

The car of Nadar's 215,000 cu. ft. spherical balloon having a lift of 4½ tons. Free ascensions were made with 15 passengers, and captive ascension with as many as 32. This record was eclipsed in 1878 by Henri Giffard's 450,000 cu. ft. balloon, which, when captive, lifted 40 people, the largest captive balloon ever built.

Above the Clouds

By C. H. Roth*

Perhaps the most thrilling of all aeronautic sports is free ballooning. The feeling one has, as the earth rapidly drops away from the ascending balloon, is one that cannot be described in words. The earth becomes a map; cities appear as in Toyland, men as mere specks, and farm-lands as a checker board—each field a different color with just enough woodland to break up the monotony. Here and there a silvery thread winds its way tirelessly toward the sea. Now and then a thin, slowly moving stream of white—a second look and we see the cause, an express train steaming rapidly along. Such beauty, such a free bird-like feeling, such calm and quiet!

The extreme quiet that is encountered in a free balloon is beyond imagination. Hardly a sound is heard, no humdrum of the city, no moaning of the wind in the trees of the woodland, no sound of birds or bees; not a breath of air is stirring to create sound, for regardless of the velocity of the wind, the balloon drifts along with it at exactly the same speed, so it seems as tho no wind is blowing. If you

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(Editor's Note: C. H. Roth was the chief instructor in free ballooning at the Goodyear Balloon School which we operated for the Government during the War. He is the author of the text book, "Fundamentals of Ballooning," which is a short course in the theory and operation of the free balloon.)

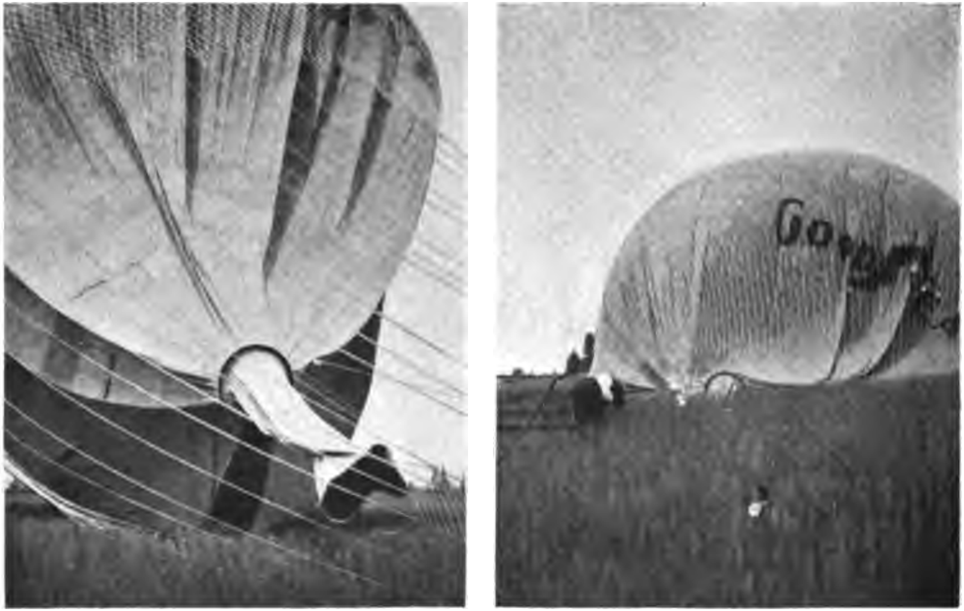
are far out of reach of the sounds of the busy earth, the extreme silence everywhere is impressive.

A large, dark, moving area appears on the earth below. What is it? It is the shadow of a cloud. Slowly overtaking it is a tiny round shadow. Suddenly we find ourselves hidden from the sun, and notice the little round shadow has disappeared. It was the shadow of our balloon.

Photo of Goodyear Blimp taken from a spherical balloon. Note the faint shadow of the spherical balloon on the dirigible.

A look upward—the clouds—a great fleecy mass of gray. The pilot orders "one bag of ballast over," and the aircraft rises as if by magic.

You look about; a fog is forming. No! You are entering a cloud. To your surprise a cloud is nothing more than a fog. Soon you are lost to sight from the earth. The air seems cooler and somewhat damp. To right and left, above and below, all is milky white. Often even the gas bag is hidden from sight. You have a feeling of being lost, of complete helplessness. You do not know how fast you are traveling or even in what direction, and furthermore, there is no known



In a high wind, upon landing it is necessary to rip a big gap in the balloon so that it will deflate immediately and not drag the basket. On the left, the basket has just struck and is being dragged on its side. On the right, 10 seconds later, the balloon has deflated sufficiently to prevent further dragging.

instrument to give you this information when in a cloud out of sight of the earth.

After a while the light becomes brighter, the mist breaks above and you enter the bright sunlight. I say "bright" with emphasis because the lack of impurities at that height, intensified by reflection from the pure white surface of the clouds below, brings forth an infinite expanse of dazzling brightness incomparable with anything ever before seen. Such a spectacle—huge billowy masses, like foam on the ocean waves, like snow capped mountains range upon range, all of the purest white, untainted by the dust and smoke of the busy earth below.

Onward you sail; now a low place shaded in beautiful contrast with the white masses; now a smaller fleecy cloud apart from the rest, seeming to have strayed away; now a hole in the clouds and again we see old Mother Earth. Its roads appear as lines of yellow, its rivers like threads of silver, and were it not for the trees and fenced-in yards, farm houses would scarcely be visible. This infinite expanse of space arrayed in all its glory can never be appreciated from descriptions—one must actually go through the experience.

At last we pull the valve cord for a few seconds and start on our downward journey. We leave the clouds above, and the humdrum of the earth is faintly heard, with train whistles and auto horns. Now voices become audible and people can be seen running ahead and others standing gazing at the balloon.

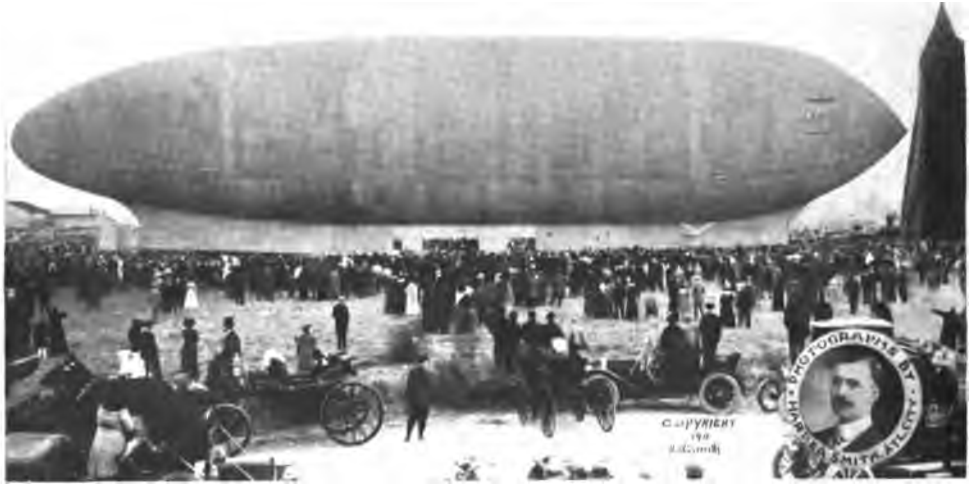
The end of the drag rope strikes, and the basket quivers as the rope whirrs along over the uneven ground. The earth comes up rapidly—we bump and bounce up ten or twenty feet. "Grab the drag rope," shouts our pilot to the group of breathless men and boys running after the balloon. They get hold, slow us down, and we settle to the ground with scarcely a jar. Thus comes to a close a most fascinating, thrilling and inspiring ride.

The Romance of an Airship Factory

THE history of the growth of The Goodyear Tire & Rubber Company, from its humble and struggling beginning twenty years ago to its present commanding position in the rubber world, is indeed one of the outstanding romances in the annals of American industry. And of the many interesting chapters that go to make up this history, one of the most romantic is the story of the development of Goodyear's one time smallest department, the Aeronautics Department.

When aeronautics was first beginning to "take hold" in America, Goodyear began to look into the future. Tho the great majority of the people then were skeptical, considering the flying machine too unsafe and impracticable ever to be of any commercial use, Goodyear had faith—believed the day would come when the airplane and the dirigible would be as much a part of our civilization as the railroad and steamship are now. Furthermore, so strong was the belief of certain officials of the company that the dirigible balloon rather than the airplane would be the big factor in this commercial future, that it was decided Goodyear should take the lead in pioneering the way in this country in the development of lighter-than-air craft.

READY-FOR-FLIGHT-AIR-SHIP-AKRON.



The Vaniman ship, the 400,000 cu. ft. envelope of which was built by Goodyear. It was the largest single compartment gas bag ever constructed up to that time (1911).

So in 1910, two of Goodyear's technical men were sent to Europe to collect all data and information available on the design and construction of balloons and balloon fabrics. When they returned we began our development work. It was a new type of work for us and we realized that we had a great deal to learn. But by persistent effort we finally developed a balloon fabric which under the laboratory tests proved to be even more gas tight than the best European fabrics.

Successful thus far, we were now ready to receive orders for balloons—and here is where the romance begins—for our first order covered the construction of the gas bag for the largest semi-rigid dirigible yet built, the 400,000 cu. ft. airship "Akron" with which Melvin Vaniman proposed to be the first to cross the Atlantic by air. This small new department at Goodyear on its first order received more business than the Company as a whole was able to get during the entire first year of its operation. No wonder is it then that we felt a thrill in starting off by building the largest gas bag ever constructed up to that time.

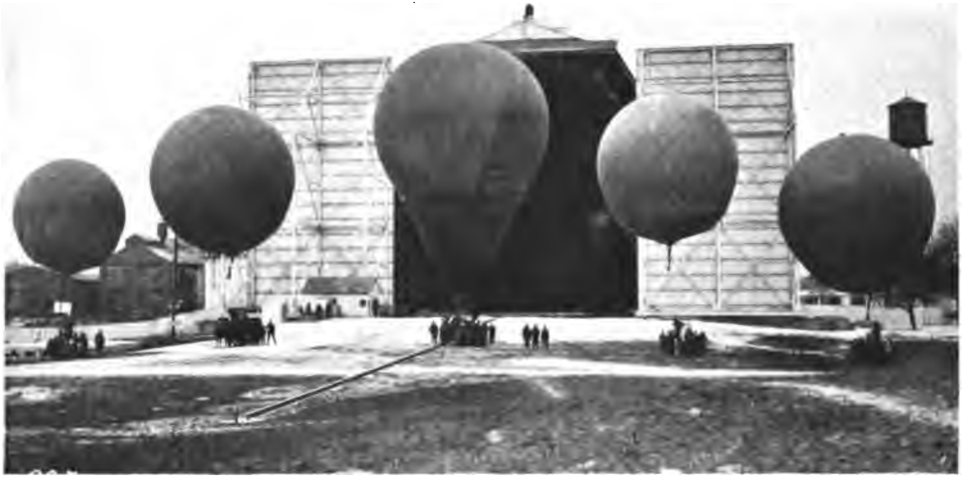
For the next six months our little department was the center of interest at Goodyear. An atmosphere of mystery seemed to surround our activities. Our visitors seemed more or less struck with awe when they entered the forbidden room. They watched the draftsmen working out the exact size and shape of every pattern, saw the long rolls of fabric cut up into these various patterns, saw these different pieces of fabric (so many of which looked alike but which had a

Goodyear Balloons leaving the Flying Field on training flights for student officers. The Goodyear Balloon School made over 3,200 flights; over 10,200 passengers were carried, and over 60,000 miles were covered.

slightly different mathematical curve to each side) cemented together, saw the balloon, heaped in a wrinkled mass around the sewing machine, having all its seams double stitched—and so on. Their remarks were interesting. Some could not believe that it was possible to mathematically compute the exact curve for every pattern; others marvelled that all those patterns could be placed together without a gap or a heavy overlap occurring when the last two should meet. "How could that heap of fabric around the sewing machine ever come out to be a smooth and flawless balloon? Surely some of the patterns would not fit with exact precision and would draw wrinkles in the balloon."

But when the huge envelope was inflated for the first time in Mr. Vaniman's hangar at Atlantic City, it filled out beautifully to its correct shape, proving to be a very high grade piece of workmanship. Mr. Vaniman made experimental flights in the fall of 1911 and the spring and summer of 1912 testing out different apparatus and equipment for the trans-Atlantic trip. He planned to make the big flight in September, the month most favorable from a weather standpoint. Then, on one of her flights in July, eight months after her first flight, someone forgot to unseal a valve before the ship left the hangar, the gas pressure rose, they could not open the valve, and the balloon burst, plunging Mr. Vaniman and his crew of five to their death.

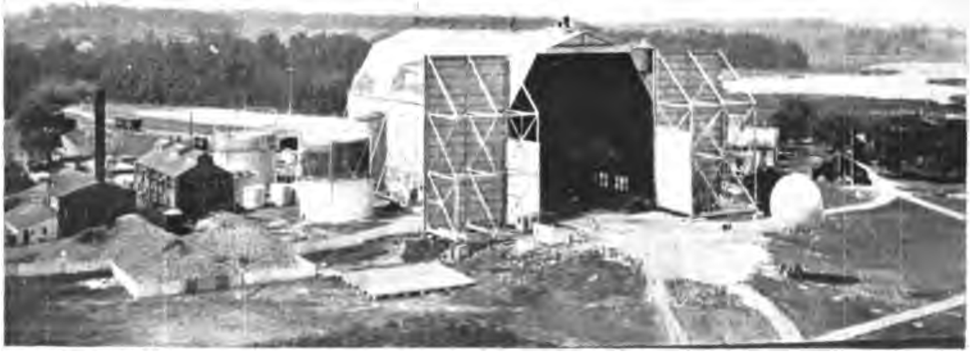
When this sad news was flashed to Akron, our department came to a standstill. We had all become acquainted with Mr. Vaniman so that the loss was a



A few of the fifteen spherical balloons constituting the equipment for training the student officers at the Goodyear Balloon School in the theory and operation of the free balloon personal one. But when the final reports showed that the accident was due in no way to any faulty workmanship on our part, we took heart again and resumed production.

At this time we were building a balloon for ourselves, which we named the "Goodyear." This balloon, an 80,000 cu. ft. spherical, also came out of production without a flaw, remained in service for four years (an unusual record), made more flights during those four years than any other balloon in the United States, and, to add to its laurels, won the National Elimination Race in 1913, which gave Goodyear the honor and distinction of being the representative of the United States in the International Race out of Paris. When our two pilots, Ralph H. Upson and R. A. D. Preston, arrived in Paris and inflated their American built balloon, the veteran European pilots of long standing who were representing their respective countries looked with scorn upon our heavy rubberized balloon—their racers were light, varnished balloons.

But Upson and Preston showed not only that they were just as well versed in the science of meteorology as their veteran opponents, but that they were more courageous, for they allowed themselves to be blown out over the ocean straight west from Paris, confident they would meet a current that would veer them north into England. Thus they won for the United States the honor of bringing the next International Balloon Race to this country.

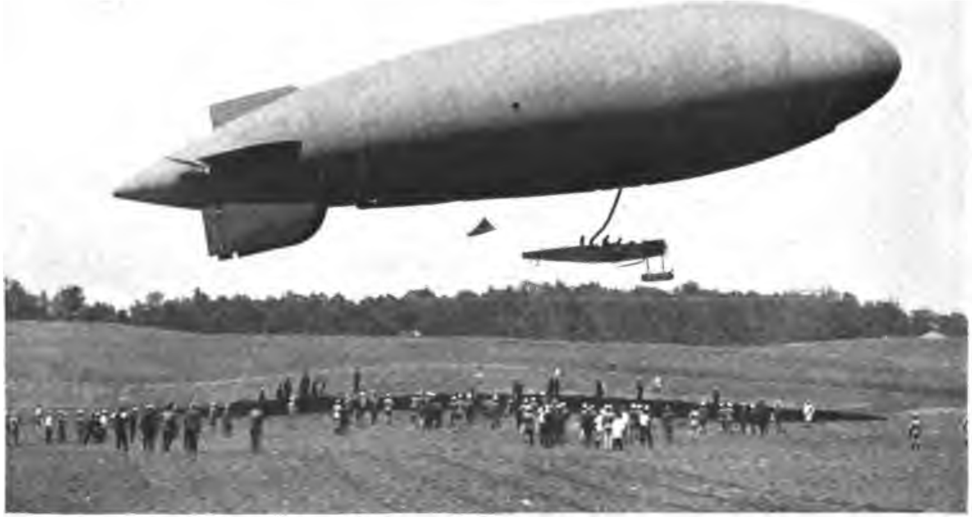


The hangar and hydrogen generating plant owned and operated by The Goodyear Tire & Rubber Company at the start of the War and later taken over by the U. S. Navy.

The activities of the Department soon stirred up interest in aeronautics to the point where the formation of an aero club was demanded. "The Goodyear Aero Club," which resulted, soon became the most active flying club in the country. During the flying seasons of 1913, '14 and '15, the club made week-end flights in the "Goodyear," the famous 80,000 cubic foot racing balloon mentioned heretofore, and in this way carried more passengers than any other aero club in the United States. We were just beginning to develop a real crowd of balloonists in Akron when the war broke out and put a stop to the sporting activities of all aero clubs.

The War—what a terrible cataclysm—and yet what good resulted from it in certain lines. In the four years of the War, greater strides were made in the development of both the airplane and the dirigible than might otherwise have been accomplished in forty years. The age of mail and passenger travel by air was brought several decades nearer to us. The good that will result from tying the world closer together by intercontinental air lines will now be realized a generation sooner.

Before the United States entered the war, Goodyear had purchased a large tract of farm land of over 650 acres, and when it was imminent that we would soon be drawn into the conflict, ground was broken for the largest hangar in this country. Thus, when the war broke upon the United States, the Government



The first U. S. Navy Blimp, manufactured by Goodyear, which broke all American records on its maiden trip, when, piloted by R. H. Upson, it flew from Chicago to within a few miles of Akron.

found Goodyear ready. Our hangar was completed almost before work had started on the six Navy hangars ordered to be rushed to completion by the Navy Department. Furthermore, we were the only experienced manufacturers of rubberized balloon fabrics in the country, and, due to having pioneered the way since 1910, were the chief source of aeronautic knowledge in the country. So the Government turned to Goodyear.

It was necessary to rush production to the limit. We finished the Navy's first dirigible even before our hangar was ready, so we shipped the gas bag, fins and car, and all necessary equipment, to a small hangar located at Chicago. By the time the dirigible was ready for flight, our hangar at Akron was ready to receive her, so on her maiden trip, without any preliminary test flights, she set out for Akron, piloted by R. H. Upson, our chief aeronautic engineer, with H. T. Kraft, his assistant, as the mechanician. Landing a few miles outside of Akron, they established a new record for long distance flight, having flown 354 miles, over three times as far as any dirigible had ever before flown in this country.

The Government now looked to us to help train their balloon personnel. We already had written a text book on how to operate a free balloon. We now prepared three more text books on "Fundamentals of Ballooning," "Kite Balloon Operation" and "Dirigible Balloon Operation" respectively, instituted several lecture courses to supplement the class room work, and soon had a full fledged

Over five hundred student officers received their training at the Goodyear Balloon School.

Balloon School established at our Flying Field. The following table gives some idea of the magnitude of the activities of this Balloon School, which was later taken over by the Navy.

	Flights	Passengers	Time	Distance
Number of Dirigible flights	769			
Number of passengers carried		2711		
Time in air			632 hrs.	
Approximate distance flown				25,280 mi.
Number of Spherical balloon flights	1312			
Number of passengers carried		4622		
Time in air			1971 hrs.	
Approximate distance flown				35,480 mi.
Number of Kite balloon ascensions	1200			
Number of passengers carried		2902		
Time in air			724 hrs.	
Totals	3281	10,235	3,327 hrs.	60,760 mi.

Total number of flights	3,281
Total number of passengers carried	10,235
Total time in air	3,327 hrs.
Total approximate distance flown	60,760 mi.

When it is realized that without a single fatality, over 10,000 passengers were carried in 3,200 flights in Goodyear balloons which traveled more than 60,000 miles and remained in the air more than 3,300 hours, the careful and

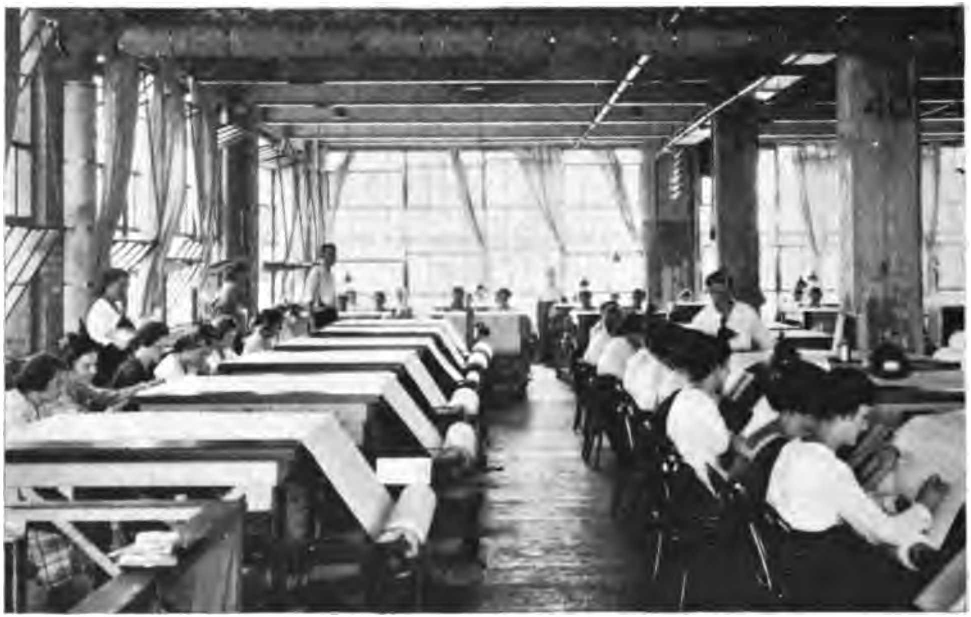
Our force of 2800 balloon workers completed balloons at the rate of five per day. Most of these workers were "Bloomer Girls."

scientific training the Goodyear Balloon School gave these Navy student officers is made evident. Over 75% of the officers trained for the balloon service of the Navy received training at the Goodyear Flying Field.

The training of the Navy's pilots was not Goodyear's only duty along educational lines—the Government had to have men for field repair and factory inspection work. So it fell to Goodyear to put these men through a production course, starting in the department where the raw cloth is first inspected, and carrying them through the various processes and departments, step by step, until they had reached the "final inspection" building, where six full size Kite balloons can be inflated with air at one time.

Never has any small department of Goodyear grown to such large proportions in so short a length of time as the Aeronautics Department. Confined to a few rooms before the War, it soon expanded to include over four acres of floor space. In fact, after we had built up our production to five complete balloons per day, there were times when the Government could not ship the balloons away as fast as we could manufacture them. Their warehouses and our storage space at times were filled to overflowing.

To build up this enormous production, we had to increase the number of employees on balloon work from a few dozen to over 2800. Furthermore, these new workers had to be trained, which was an undertaking in itself. It is a tribute

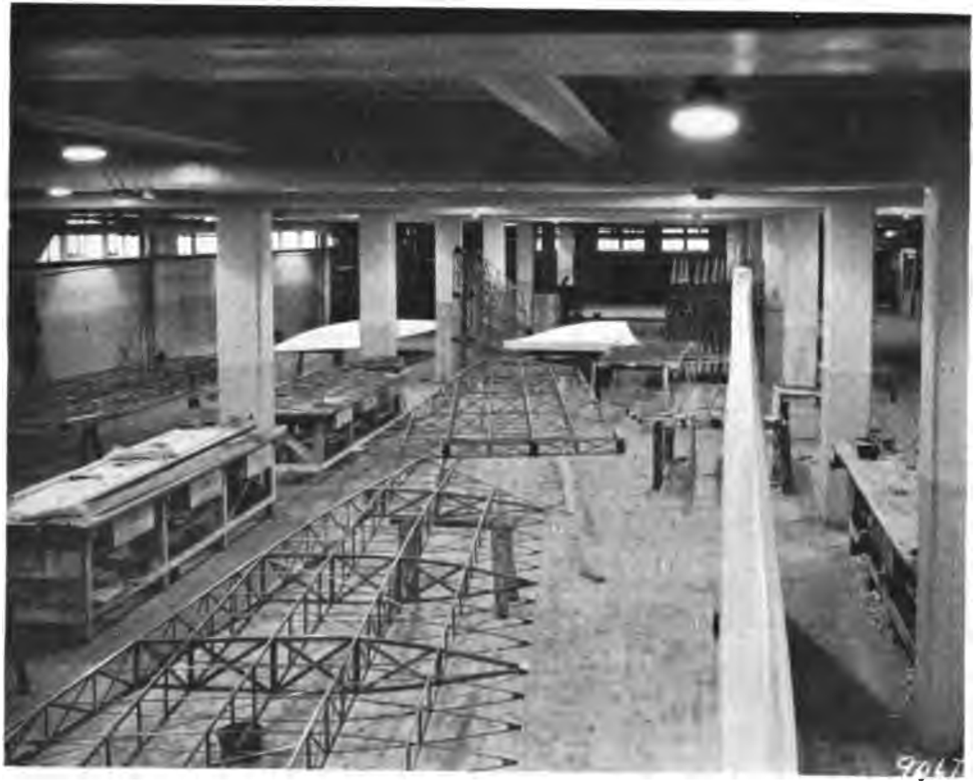


Balloon Cloth Inspection Room, where at our maximum production during the war, 22,000 yards per day were inspected.

to these workers, the majority of whom are women ("bloomer girls" as they are called) that we have received no reports of any defective workmanship in any of our many balloons, which number over one thousand.

One department that is composed entirely of women workers is the Cloth Inspection Department, where all the silk and cotton balloon cloth is minutely inspected. All small knots and slubs must be picked and combed and all light and heavy places marked. So exacting is this inspection that the average amount each girl can cover in eight hours is only 200 yards. This means that the cloth passes before her at the extremely slow rate of only 15 inches per minute. In spite of this tediously slow rate of inspection, we managed to build up this department to a point where we were turning out 22,000 yards of inspected cloth per day. During the eighteen months of our maximum production, we inspected over 4,226,000 sq. yds. of cloth. From a balloon production standpoint, these figures are astounding—for if it were possible to build all this cloth into one balloon, it would make a spherical balloon with a capacity of 6,750,000,000 cu. ft. and a gross lift of 229,500 tons.

Besides expanding the Balloon Department proper, with its several supplementary departments such as "Cloth Inspection," we had to develop several new departments. Ever since our small and inexperienced beginning back in 1910, it has been our aim to build up a complete "Airship Factory" here at Akron.



Goodyear Fin Dept.

The volume of business brought on by the war at last made it possible for us to branch out, so we added to the Aeronautics Department a Cordage Department, a Fin Department and a Car Department. We brought seasoned sailors to Akron to form the nucleus of our Cordage Department, and they in turn instructed other workmen in their art of making knots and splices. Similarly with our Fin and Car Departments. We brought together a small group of skilled woodworkers who had had experience in airplane factories and soon built up these departments so that it is now no longer necessary for us to look to the airplane manufacturer for wood parts for our dirigibles. Thus we now have a complete manufacturing unit for dirigible balloons—a real "Airship Factory."

The question that arises in the minds of many is, "What are you going to do with this Airship Factory now that the War is over?" They do not yet realize that we are on the threshold of a new era—the era of aerial transportation on a commercial basis. They do not realize that the world is soon to be bound together by aerial lines that will make the different continents all neighbors.

We therefore are not confronted with the problem of dismantling an "Airship Factory" which was built up purely as a war emergency. Rather are we confronted with the problem of increasing the facilities of that factory so that we can construct the mammoth airships the commercial future will require.

The Goodyear Aeronautics Department

Our Aero Experimental Division is constantly at work on the development and improvement of many types of aeronautical equipment, and is ready at all times to prepare specifications and estimates on any new work it is practicable for us to handle.

The following list of our standard products will suggest the scope of our activities in manufacturing "*balloons of any size and every type*" and in furnishing "*everything in rubber for the airplane.*"

LIGHTER-THAN-AIR DIVISION

Balloons of Any Size and Every Type

1. *Dirigible Balloons*
   Capacities, cu. ft.—35,000; 84,000; 95,000; 180,000; 320,000; 770,000; etc.
2. *Kite Balloons* (*Captive*): Capacities, cu. ft.—8,000; 19,000; 33,000; 37,000.
3. *Spherical Balloons* (*Free*)
   Capacities, cu. ft.—9,000; 19,000; 35,000; 50,000; 80,000.
4. *Spherical Balloons*
   For advertising; for aerial photography; for target practice. Diameters, ft.—6, 8, 10, 15, 20.
5. *Parachutes*
   One-man type, diameter, 26 ft. Two-man or Basket type, diameter, 40 ft. Special designs for mail-bags, etc.

6. *Balloon Accessories* (for Dirigibles, Kites and Sphericals)
   Fabric—1, 2 and 3 ply; tape; cement; valves; instruments; spare parts; etc.
7. *Gas Containers* (for both industrial and aeronautical uses)
   Capacities, cu. ft.—100; 200; 300; 500; 1,000; 2,500; 5,000; 10,000.
8. *Pontoons* (pneumatic and collapsible)
   For dirigibles; for airplanes; for marine salvage work.

HEAVIER-THAN-AIR DIVISION

Everything in Rubber for the Airplane

1. *Airplane Tires:* Casings; Tubes; Streamline shields.
2. *Bumpers and Miscellaneous Parts:*
   Tachometer guards; control wheel bumper; tail skid bumper; foot pad; landing gear axle bumper; starting crank bumper; starting crank rest; landing gear lower recoil; landing gear upper recoil; shock pads—lower, upper; rubber washer for petrol tank; tail light grommet.
3. *Connections:* Molded gasoline connections; wrapped construction.
4. *Hose:* Aircraft gasoline hose; aircraft radiator hose; capped end radiator hose.
5. *Cable Streamline:* For single cables; for double cables.
6. *Pontoons:*
   Collapsible, for emergency inflation in case of forced descent over water.
7. *Gasoline Tanks:* Fire-proof; leak-proof; crash-proof.

Goodyear Domestic Branches

Akron, Ohio, 1144 E. Market St.
Albany, N. Y., 318 Broadway
Atlanta, Ga., 191-199 Marietta St.
Baltimore, Md., Cathedral and Preston Sts.
Billings, Mont., 1707 Second Ave., N.
Birmingham, Ala., 420-422 Twentieth St.
Boise, Idaho, Idaho & 1st Sts.
Boston, Mass., 61 Brookline Ave.
Buffalo, N. Y., 1013 Main St.
Butte, Mont., Iron St. and Nevada Ave.
Cedar Rapids, Iowa, 407 B Ave., East
Charlotte, N. C., 244 W. First St.
Cincinnati, Ohio, 217-219 E. Eighth St.
Chicago, Ill., 1550 Indiana Ave.
Cleveland, Ohio, East 21st St. and Chester Ave.
Columbus, Ohio, 87 N. Fourth St.
Dallas, Texas, 32 Main St.
Dayton, Ohio, 117 S. Perry St.
Denver, Colo., 1541 Lincoln St.
Des Moines, Iowa, 1022-24 W. Locust St.
Detroit, Mich., 340-342 Jefferson Ave.
Duluth, Minn., 106 W. 1st St.
El Paso, Texas, 1405-7 Texas St.
Fargo, N. D., 217 Broadway
Fresno, Cal., 2126-32 Inyo St.
Grand Rapids, Mich., 167-69 Division Ave., S. W.
Great Falls, Mont., 1010 First Ave. S.
Hartford, Conn., 26 High St.
Houston, Texas, 909 San Jacinto St.
Indianapolis, Ind., Cor. Walnut St. and Capitol Ave.
Jacksonville, Fla., 730 West Bay St.
Joplin, Mo., Second and Joplin Sts.
Kansas City, Mo., 1417 McGee St.
Knoxville, Tenn., 407-409 State St.
Little Rock, Ark., 612 Louisiana St.
Los Angeles, Cal., 1200 S. Olive St.
Louisville, Ky., 331 E. Broadway
Milwaukee, Wis., 258 Milwaukee Ave.
Minneapolis, Minn., 1312-14 Harmon Pl.
Memphis, Tenn., 620 Marshall Ave.
Minot, N. D., 30 E. Central Ave.
Nashville, Tenn., 911 Broadway
Newark, N. J., 500-504 Central Ave.
New Orleans, La., 820 Howard Ave.
New York, N. Y., 123 W. 64th St.
Oakland, Cal., 2143-2147 Broadway
Oklahoma City, Okla., 208-10 West 2nd St.
Omaha, Neb., 2549 Farnum St.
Phoenix, Ariz., 324 N. Central Ave.
Philadelphia, Pa., Broad and Huntington Sts.
Pittsburgh, Pa., 3724 Bigelow Blvd.
Portland, Me., 186 State St.
Portland, Ore., 104 N. 14th St.
Providence, R. I., 91 Broadway
Richmond, Va., 323 W. Broad
Rochester, N. Y., Court and Courtland Sts.
Sacramento, Cal., 1011-15 14th St.
Salina, Kans., 222 N. Santa Fe St.
Salt Lake City, Utah, 342 So. State St.
San Antonio, Texas, 311 Avenue "C"
San Diego, Cal., 1220 Third St.
San Francisco, Cal., 1563-1571 Mission St.
Scranton, Pa., 314 N. Washington Ave.
Seattle, Wash., 1418 9th Ave.
Sioux City, Iowa, 513 Sixth St.
Spokane, Wash., 817 First Ave.
Springfield, Mass., 28 Worthington St.
St. Louis, Mo., 3010 Locust St.
Syracuse, N. Y., 218 Willow St.
Tacoma, Wash., 1111 "A" St.
Toledo, Ohio, 1320 Madison Ave.
Washington, D. C., 1016 16th N. W.
Youngstown, Ohio, 832 Market St.

Goodyear Foreign Distribution

The Goodyear Tyre & Rubber Co. (Gt. Britain), Ltd.
162 Shaftesbury Avenue
London, W. C. 2, England

English Branches

Belfast, 6 Victoria Square
Glasgow, 61 Bath St.
Manchester, 3 Southgate
Bristol, 52 Victoria St.
Birmingham, 59 John Bright St.

Ciá Española de Neumáticos y Caucho Goodyear (SA)
Paseo de Gracia 93
Barcelona, Spain
Branch at: Calle de Recoletos 1
Madrid, Spain

The Goodyear Tyre & Rubber Company of (South Africa,) Ltd.
39 Hout Street
Capetown, South Africa

The Goodyear Tyre & Rubber Company of (South Africa,) Ltd.
Cr. of Harrison & Marshall Streets (Temporary)
Johannesburg, South Africa

The Goodyear Tire & Rubber Co.
76-82 Calle Soler
Manila, P. I.

The Goodyear Tyre & Rubber Co. of Australasia, Ltd.
Dalton House.
Pitt Street
Sydney, N. S. W., Australia

The Goodyear Tyre & Rubber Company of New Zealand, Ltd.
71 Courtenay Place
Wellington, New Zealand

The Goodyear Tire & Rubber Company
Amistad 96
Havana, Cuba

The Goodyear Tire & Rubber Company of South America
Colon, Panama
(Mailing Address: P. O. Box 138—Cristobal, Canal Zone)

The Goodyear Tire & Rubber Company of South America
Avenida Rio Branco 249-251
Rio de Janeiro, Brazil

The Goodyear Tire & Rubber Company of South America
Avenida Sao Joao 74
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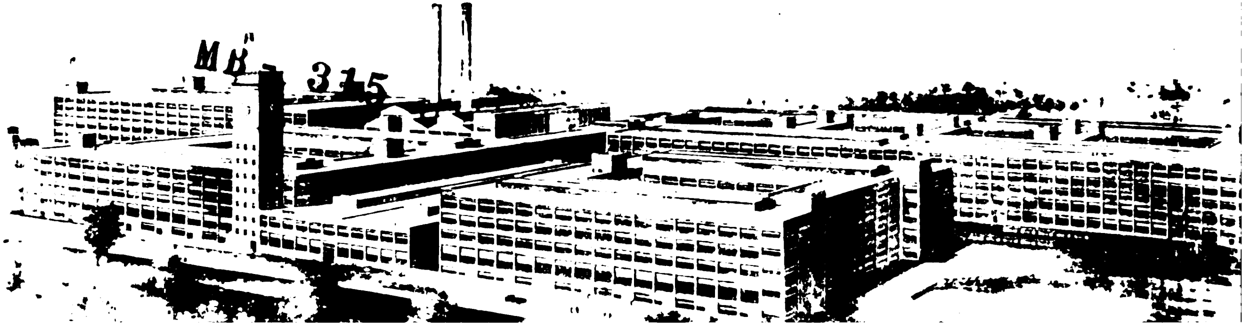
The Goodyear Tire & Rubber Company of South America
Alsina 902, Esq. Tacuari
Buenos Aires, Argentine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